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Approach to Developing 'De Minimis' Values for the Noncriteria Air Pollutants

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16. ABSTRACT

In analyzing the basis for de minimis emissions rates, it is apparent that two distinct classes of pollutants are involved. The class which is addresses in this paper consists of the noncriteria pollutants for which no ambient air quality criteria documents exist. Rather, these pollutants are only regulated within either the New Source Performance Standards (NSPS) or the National Emission Standards for Hazardous Air Pollutants (NESHAPs), both of which are based on a national emissions standards, rather than an air quality management approach. Thus, it appears reasonable to develop de minimis cutoffs from separate perspectives--that is, to base criteria pollutant de minimis emission cutoffs on air quality "design values" and to bas the noncriteria pollutants de minimis values on the emissio rates embodied in the NSPS and NESHAP

Recommended noncriteria pollutant emission rates were developed from the existing standards as found in 40 CFR Parts 60 and 61. In general, a fraction of the applicable standards was used to determine the noncriteria pollutant de minimis emission rates. Since the NSPS represents the best adequatley demonstrated control technology ona nation wide basis, and the NESHAPs are established with an ample margin of safety to protect the public health from hazardous pollutants, a small percentage of these standards would, for PSD purposes, prevent a significatn change from escaping review.

In this analysis emission levels representing 20 percent of an NSPS emission standard, and 10 percent of an NESHAP emission standard wer determined for PSD review Objectives.

17. KEY WORDS AND DOCUMENT ANALYSIS

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BACKGROUND

In the Alabama Power decision, the court indicated that emissions from certain small modifications, and emissions of certain pollutants at new sources, could be exempted from some or all PSD review requirements on the grounds that such emissions would be de minimis. In other words, the Administrator may determine levels below which there is no practical value in conducting an extensive PSD review. The September 5 proposal incorporated the de minimis concept and requested comments on the approach taken. At that time, the Administrator noted that because of the urgency associated with the proposal, the de minimis numbers published were not supported by extensive analysis, and that a more thorough analysis would be undertaken prior to promulgation.

Accordingly, a reassessment of the de minimis issue has been undertaken. A significant part of the reassessment involved the use of reasonable judgment, especially since this is an area in which not only are data limited, but criteria for decision making are almost non-existent. The first task was to identify the objectives to be met in selecting de minimis values. A primary objective identified was to assure meaningful permit reviews, i.e. obtaining useful air quality information or obtaining greater emission reductions as a result of BACT analysis beyond what would be expected from normal state permit or NSPS/NESHAPS processing.

There were three basic alternatives available for specifying de minimis cutoffs--one based solely on air quality impact, one based solely on emission rate, and one based on a combination of these, such as was proposed on September 5. It is recommended that de minimis

cutoffs be specified in terms of emission rate for applicability, BACT and air quality analysis purposes, with no provisions for case-by-case demonstration of a source's air quality impact. This approach is recommended for several reasons. First, the Congress specified emission rates, not projected air quality impacts, in the Clean Air Act as the criteria for determining which sources are major and, therefore, subject to PSD review. Moreover, the court, in the Alabama Power decision, continually refers to emission rate rather than air quality concentration in its discussion of the de minimis issue. Therefore, it seems inconsistent with the existing guidance to abandon the emission rate concept.

Second, if applicability decisions depended on confirming a demonstration by the source that its impact would be less than a given air quality level, the review process would become excessively complex and greatly increase the resources needed by reviewing authorities to carry out the program. In addition, such an approval requirement would create an atmosphere of uncertainty as to whether individual sources needed to apply for a permit or not, and could lead to uneven application of the regulations from state to state. Third, the task of establishing de minimis air quality levels for noncriteria pollutants, with proper consideration of threshold levels and factors of safety (if any), is very complex and cannot be done in the time available.

Finally, given the inclusion of a de minimis exclusion for monitoring, it serves little purpose to have a separate table to permit an exclusion from the remaining air quality impact analysis requirement. (A separate table would be required because monitoring capability and concern for potential effects are unlikely to be associated with the

same air quality concentrations.) Besides making the regulations more complicated, the demonstration necessary to earn an exemption from air quality impact analysis would in itself be an air quality impact analysis.

In analyzing the basis for de minimis emission rates, it is apparent that two distinct classes of pollutants are involved. The first consists of the criteria pollutants for which extensive health and welfare information has been reviewed and criteria documents developed. The other class, which is primarily addressed in this paper, consists of the noncriteria pollutants for which no ambient air quality criteria documents exist. Rather, these pollutants are only regulated within either the New Source Performance Standards (NSPS) or the National Emission Standards for Hazardous Air Pollutants (NESHAPs), both of which are based on a national emissions standard, rather than an air quality management appproach. The regulations developed under both these regulatory alternatives generally specify emission limitations and/or equipment performance standards, rather than minimum air quality levels that must be achieved as in the case of the criteria pollutants. Thus, it appears reasonable to develop de minimis cutoffs from separate perspectives--that is, to base criteria pollutant de minimis emission cutoffs on air quality "design values" and to base the noncriteria pollutants de minimis values on the emission rates embodied in the NSPS and NESHAPs.

APPROACH

Recommended noncriteria pollutant emission rates were developed from the existing emission standards (NSPS and NESHAPs) as found in 40 CFR Parts 60 and 61. In general, a fraction of the applicable standard

was used to determine the noncriteria pollutant de minimis emission rates. Since the NSPS represents the best adequately demonstrated control technology on a nationwide basis, and the NESHAPs are established with an ample margin of safety to protect the public health from hazardous pollutants, a small percentage of these standards would, for PSD purposes, prevent a significant change from escaping review.

In this analysis emission levels representing 20 percent of an NSPS emission standard and, because of their greater impact on health, 10 percent of an NESHAP emission standard were determined. These values are believed to be stringent, but fair, criteria for defining insignificant changes in the context of PSD review objectives. The air quality impacts of the resulting de minimis emission rates for NSPS pollutants were then calculated using recommended EPA modeling methods, and the concentrations were compared to available health and welfare data to assure that significant adverse effects were avoided. In the case of fluorides, this check resulted in a reduction of the emission rate originally indicated. No adjustment based on resultant effect was made for the hazardous pollutants since the NESHAP emission rate is, in itself, intended to protect the public health with an ample margin of safety; therefore, ten percent of such a value is believed to be sufficiently stringent for use as a de minimis value.

Other options were reviewed before using the approach mentioned above. Some commenters to the September 5, 1979 proposal of PSD regulations suggested the de minimis emission rate should be based on existing monitoring technology. Their argument was that if we could not reasonably

measure the pollutant either in the stack gas or in the atmosphere by accepted techniques, then the pollutant emission rate or concentration was too small for PSD program review. However, this approach is not recommended. Although such a criterion may be useful for determining significance for monitoring purposes, it does not necessarily have a relationship to environmental effects. Moreover, such an approach creates the potential of having a changing basis for deriving de minimis values--as soon as EPA approved a more sensitive technique to measure a pollutant, the regulatory decision-making process would be altered for that pollutant. Since EPA is expecting to improve monitoring capabilities over time, the constantly changing de minimis values could prove to be impractical.

Another approach considered was to evaluate the existing health and welfare studies, assess thresholds and factors of safety (if any) and decide upon de minimis air quality concentrations for each pollutant. Then, using accepted modeling techniques, establish representative de minimis emission rates. In effect, this approach would be similar to that for setting or revising a national ambient air quality standard. It too was rejected, primarily for two reasons. First, the process could be expected to be quite time consuming, given our experience in developing the NAAQS, and certainly could not be done in the time available. Second, standard setting, with extensive public input, has already been undertaken for each of the noncriteria pollutants. Given the review already performed on these pollutants, it is not clear what added insight would be gained from an exhaustive analysis of impacts from emissions at rates substantially smaller than those represented by the existing standards. By making a check of the expected impact of the NSPS pollutant

de minimis emission rates, it is believed that unacceptable environmental consequences can adequately be avoided.

The following portion of this paper discusses the results of the recommended approach for defining the noncriteria pollutant de minimis emission rates. The NSPS pollutants are presented first and the NESHAPs pollutants second.

NSPS POLLUTANTS

Fluorides. The EPA report Primary Aluminum: Guidelines for Control of Fluoride Emissions from Existing Primary Aluminum Plants, EPA-450/2-78-049b, indicates that the average primary aluminum plant produces 157,000 tons of aluminum per year. The NSPS for primary aluminum plants is set at about 2 pounds of fluoride emissions for each ton of aluminum produced and reflects a well controlled plant. Applying the 2-pound-per-ton-of-aluminum emission rate to the average primary aluminum plant production rate of 157,000 tons per year yields a fluoride emission rate of 157 tons per year for the average well controlled plant. Twenty percent of the average plant's fluoride emission rate equals about 30 tons per year.

Low levels (about 1.0 microgram per cubic meter 24 hour average) of floruides have been observed to produce effects on vegetation. See Health Impacts, Emissions, and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted from Stationary Conventional Combustion Processes, EPA-450/2-80-074. The possible impacts from a 30 ton per year de minimis emission rate were calculated using average stack emission parameters as defined in the support document Impact of

Proposed and Alternative De Minimis Levels for Criteria Pollutants, EPA-450/2-80-072. This report provides a ratio of an expected maximum air quality concentration per ton of emissions for a variety of source categories. The source data used was taken from the existing PSD permit files. Using the population of sources making less than 100 ton per year changes (i.e., those expected to be most affected by the de minimis values), the resultant ratio is 0.325 micrograms per cubic meter (ug/m^3) per ton of emissions. To calculate the maximum 24-hour concentration expected under this average condition, the 30-ton-per-year fluoride emission rate was multiplied by the impact factor of 0.325, giving a maximum 24-hour impact of 10 micrograms per cubic meter (10 times the concentration where effects have been observed). Thus, to protect sensitive vegetation, it is recommended that the de minimis fluoride emission rate be limited to 3 tons per year.

An alternative would be to base the emission rate on the NSPS for phosphate fertilizer plants. Fertilizer plants typically emit much less flourides than aluminum plants--a well controlled 500-ton-per-day plant would emit 10 pounds of fluorides per day (about 2 tons per year). See page 22, Background Information for Standards of Performance: Phosphate Fertilizer Industry, EPA-450/2-74-019a, October 1974. A 20 percent de minimis value would then be less than 0.5 ton, which is unrealistic in view of both aluminum plants and coal fired power plants. A well controlled coal fired power plant of 500 megawatt capacity could emit 10 tons of fluorides per year. Minor changes at such plants could trigger review with little prospect for meaningful reduction in emissions or improvement in air quality. Moreover, changes

at a fertilizer plant that resulted in an increase of 0.5 ton per year would probably be reviewed under NSPS and/or State new source review requirements.

Sulfuric Acid Mist. The only sources for sulfuric acid mist emissions under NSPS are sulfuric acid plants. An average plant size is about 1300 tons of acid production per day, according to page 4-2 of the report A Review of Standards of Performance for New Stationary Sources - Sulfuric Acid Plants, EPA-450/3-79-003, January 1979. A well controlled plant emits 0.15 pound of sulfuric acid mist per ton of acid produced; therefore, the sulfuric acid mist emission rate for the average plant equals 195 pounds per day (35 tons per year). Applying the 20 percent factor to the 35 tons per year of acid mist emissions equals 7 tons per year. Thus, the suggested sulfuric acid mist de minimis emission rate is 7 tons per year.

The associated air quality concentration that would occur downwind from a sulfuric acid plant making such a de minimis change was evaluated. As for the fluoride calculations, the impact factor of 0.325 was applied to the emission rate of 7 tons per year, yielding a 2 ug/m^3 maximum 24-hour concentration of sulfuric acid mist. This value is well below concentrations known to produce any health or welfare effects. See e.g., Health Impacts, Emissions, and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted from Stationary Conventional Combustion Processes, EPA-450/2-80-074.

Total Reduced Sulfur. The total reduced sulfur compounds are regulated for only the kraft pulp mill source category. A typical well

controlled plant, from data on pages 2-3 and 8-5 of the Standards Support and Environmental Impact Statement: Proposed Standards of Performance for Kraft Pulp Mills, EPA-450/2-76-014a, September 1976, has a production rate of about 900 tons of pulp per day and emits 0.25 pound of total reduced sulfur per ton of pulp produced. Thus, a typical pulp mill will emit about 41 tons of total reduced sulfur to the atmosphere each year. Twenty percent of the 41-ton-per-year figure equals a de minimis emission rate of 8.3 tons per year. It is recommended that this approximation be rounded to 10 tons for administrative purposes.

As for the other pollutants, the potential ambient impact was checked, using a one hour averaging time because of a person's relatively short-term sensitivity to odor effects. The calculated maximum impact (8 micrograms per cubic meter, 1-hour average) from a 10 ton per year emission rate is below nuisance levels. See page 9-2 of the above Standards Support Document. The values shown estimate the level at which the presence of the substance can be detected. Although the report shows odor thresholds for some of the chemical components of total reduced sulfur to be in the region of 8 ug/m^3, generally a multiple increase above the odor threshold is necessary for the sulfur compound concentrations to become objectionable in ambient air. See page 8-42 of Odors from Stationary and Mobile Sources, National Academy of Sciences, Washington, D.C., January 1979.

Reduced Sulfur Compounds. Petroleum refineries are regulated for their reduced sulfur compounds by the NSPS. A model refinery with a sulfur recovery plant production rate of 100 long tons per day will emit

about 47 tons of reduced sulfur compounds per year. This value is calculated from data in the Standards Support and Environmental Impact Statement: Proposed Standards of Performance for Petroleum Refinery Sulfur Recovery Plants, EPA-450/2-76-016a, September 1976. The de minimis emission rate calculated using the 20 percent factor is 9.4 tons of reduced sulfur compounds per year. Using an emission rate rounded to 10 tons per year (for consistency with TRS), the estimated 1-hour maximum impact of 8 micrograms per cubic meter is below levels where observed health and welfare effects have been observed. See Table 7.1 of the Standards Support document.

Hydrogen Sulfide. Like the other sulfur compounds, hydrogen sulfide is specifically regulated by NSPS for only one source category. Under Subpart J of 40 CFR 60, petroleum refineries are limited to 10 ppm of hydrogen sulfide in the gases discharged into the atmosphere from a Claus sulfur plant using a reduction control system not followed by incineration. For an average facility of 100 long tons of sulfur production per day, the NSPS emission limitation equates to 1.5 tons of hydrogen sulfide emissions per year. At 20 percent, an emission rate of 0.3 ton per year of hydrogen sulfide is indicated.

This emission rate is very low when compared to the other sulfur compounds regulated only under the NSPS. The recommended reduced sulfur compounds and the total reduced sulfur compounds de minimis emission rates (which include hydrogen sulfide) is 10 tons per year. Since the other sulfur species are regulated for similar potential welfare effects

(odor) and the threshold values for odor are of the same magnitude, it seems reasonable that the de minimis rate for hydrogen sulfide be equal to the other two sulfur compound de minimis emission rates. Maximum one hour concentrations from a 10-ton-per-year emission rate is estimated to be 8 micrograms per cubic meter, below concentrations where perceptible odors or other effects have been observed. See Table 7.1 of the Standards Support Document for sulfur recovery plants. In view of the above, it is recommended that a 10-ton-per-year de minimis emission rate for hydrogen sulfide be used.

NESHAP POLLUTANTS

Mercury. The NESHAP limitation for mercury is given as an emission rate, 2300 grams per day, which is approximately one ton per year. See 40 CFR 61.52(a). Using 10 percent of the regulated emission rate, the calculated de minimis emission rate is 0.1 ton per year. To put this emission rate into perspective, a well controlled 500 MW coal fired power plant emits about 0.4 tons of mercury per year.

Beryllium. As in the case with mercury, the NESHAP limitation is given as an emission rate of 10 grams of beryllium emitted per day. See 40 CFR 61.32(a). Ten percent of 10 grams per day equals 0.0004 ton per year, the recommended de minimis emission rate for beryllium. The example well controlled 500 MW boiler noted above would emit about 0.004 tons of beryllium per year.

For the hazardous air pollutants asbestos and vinyl chloride which were regulated because they were found to be carcinogenic, no absolutely safe

threshold of exposure can be identified. (Proposed policy for Regulation of Airborne Carcinogens, 44 FR 60033, October 10, 1979.) Therefore, no level of exposure can be presumed de minimis from a health standpoint. Based on this presumption, consideration was given to using a de minimis level of zero. However, setting de minimis levels of zero would trigger PSD reviews of sources emitting pollutants at levels well below the level at which any NESHAP was set for that pollutant. This result seems unnecessary given that the reviews are particularly resource intensive and the NESHAP limit emissions of the subject pollutants to the extent necessary to prevent unreasonable risk to the public. Therefore, as in the case of mercury and beryllium, an attempt was made to establish de minimis levels for asbestos and vinyl chloride that represent only a small fraction of the estimated emissions allowable under the existing standards.

Asbestos. The NESHAP is expressed in terms of visible emissions and work practice standards rather than in numerical terms. Therefore, estimates had to be made of the allowable emissions of asbestos from various sources. It is impossible to estimate asbestos emissions on an industry wide basis because of the lack of data, but rough estimates for several specific sources were made. The emissions were calculated from a very limited data base, and involve assumptions concerning plant parameters such as plant size, gas stream flow rate, and gas stream temperature. They are, however, the best estimates available on asbestos emissions. Three plant categories covered by the asbestos NESHAP were looked at

(see 40 CFR 61.23). These included asbestos milling operations, manufacturing operations using asbestos in the process, and asbestos asphalt operations. The details of the emission calculations are described in a staff memorandum from G. Wood to J. Weigold dated June 19, 1980. The emissions estimates for the three plant categories, based on the use of a bag-house as candidate best available control, was as follows: asbestos milling, 0.2 tons per year (TPY); operations using asbestos manufacturing, 0.07 TPY; and asbestos asphalt, 0.04 TPY.

An estimate of the asbestos emissions from rock crushing operations (not regulated by a NESHAP) was also made. Rock crushing was selected since it is a common industrial operation in which asbestos can be, in a small number of cases, a trace constituent of the raw material. Emissions of asbestos from such operations would be controlled as part of the total particulate emission control effort. A typical rock crushing plant at 150-ton-per-hour production rate would, after application of good controls, emit about 60 tons per year of particulates. Using an estimated asbestos content in the rock of 0.1 percent, asbestos emissions would be 0.06 TPY.

Given the variation in emissions from the different source categories that were examined, the question arose as to which source category should be used to establish a de minimis emission rate. The staff recommendation is based on two considerations: (1) in view of the carcinogenicity of the pollutant, the de minimis value should be based on a small source of asbestos, and (2) such source type should represent the bulk of the asbestos emitting facilities. Manufacturing operations using asbestos fit these criteria. As noted above, they emit about the same as the

asbestos asphalt and rock crushing operations, and considerably less than an asbestos milling source. Further, these plants are by far the most numerous of any of the categories examined. Therefore, it is recommended that the asbestos de minimis emission rate be set at ten percent of the calculated emissions from manufacturing operations using asbestos -- i.e., 0.007 tons per year.

Vinyl Chloride. Unlike mercury and beryllium, the NESHAP standard is expressed in parts per million of the stack gas. This concentration limit must be combined with volume data to arrive at an emission rate. It was therefore necessary to assume model plant characteristics in order to develop expected emissions. Because vinyl chloride is a carcinogen and because it is desired to establish a de minimis level representing a small fraction of emissions allowed by the NESHAPs, these calculations were based on a small regulated plant. In the Standard Support and Environmental Impact Statement: Emission Standard for Vinyl Chloride, EPA-450/2-75-009, October 1975, the Agency addressed the various sources of vinyl chloride and the size range for the predominant source categories. The Standard Support Document lists the existing (1975) polyvinyl chloride plants on page 3-32, showing a range of plant production of 2 to 135 million kilograms per year. Capacity of small plants listed varies from 2-15 million kilograms. Assuming that the smallest plant can apply controls as effective as the typical plant mentioned above, the corresponding controlled emission rate is about 6 tons of vinyl chloride per year.

Similarly, as shown on page 3-30 of the Standard Support Document, the smallest ethylene-dichloride-to-vinyl-chloride plant manufactures 70

million kilograms per year of products, and a well controlled plant would emit about 17 tons per year of vinyl chloride. These two source categories account for about 96 percent of all the vinyl chloride emissions. Therefore, controlled emissions from a small plant appear to be roughly 10 tons per year for the above mix of sources. The recommended *de minimis* emission rate (10 percent of the small source emissions) is 1 ton of vinyl chloride emissions per year.

Appendix

Example Calculations

FLOURIDES

Regulations Governing Emissions:

New Source Performance Standards (NSPS), 40 CFR 60.192, 202, 212, 222, 232, 242.

Sources regulated:

Primary aluminum reduction plant, $\sim$ 2 pounds per ton aluminum , wet process phosphoric acid plants - 0.02 pound per tons of P_2O_5, superphosphoric acid plants - 0.01, diammonium phosphate plants - 0.06, triple superphosphate plants - 0.2, grannular triple superphosphate storage facilities - 5.0×10^{-4} pounds per hour per ton P_2O_5 stored.

Calculations:

According to the reference, "Background Information for Standards of Performance: Phosphate Fertilizer Industry," EPA-450/2-74-019a, page 22, a typical 500 tons of P_2O_5 per day, well-controlled, would emit (assuming continuous operation)

$$500 \text{ tons/day} \times 0.02 \text{ pound}^*/\text{ton} \times 365 \text{ days/year} \times \frac{1}{2000} \text{ ton/pound}$$

$$= \underline{1.8 \text{ tons/year}} \ (20\% = 0.36 \text{ ton/year})$$

For the superphosphoric acid plants, typically about 200 tons per day P_2O_5 production (see page 30) would emit:

$$200 \text{ tons/day} \times 0.01 \text{ pound}^*/\text{ton} \times 365 \text{ days/year} \times \frac{1}{2000} \text{ ton/pound} = \underline{0.4 \text{ ton/year}} \ (20\% = 0.08 \text{ ton/year})$$

In the "Primary Aluminum: Guidelines for Control of Fluoride Emissions from Existing Primary Aluminum Plants," EPA-450/2-78-049b, December 1979, page 3-12, the average plant capacity is 157×10^3 tons per year. The controlled emission rate would equal:

* NSPS emission limitation

157×10^3 tons/year $\times$ 2 pounds*/ton $\times \frac{1}{2000}$ ton/pound =

157 tons/year

**twenty percent would then equal:

20% $\times$ 157 tons/year = 32 tons/year

The air quality impact from a 30-ton per year source can be estimated. From the PEDCo report, "Impact of Proposed and Alternative De Minimis Levels for Criteria Pollutants," EPA-450/2-80-072, 1980, page 4-31, there is a factor that can be used to calculate an approximate 24 hour impact from a tons per year emission rate:

$$30 \text{ tons/year} \times 0.325 \frac{\text{microgram/cubic meter}}{\text{ton/year}} =$$

9.7 micrograms/cubic meter (24 hour average)

A tenfold reduction in emissions would give a tenfold reduction in the air quality impact.

$$3 \text{ tons/year} \times 0.325 \frac{\text{microgram/cubic meter}}{\text{ton/year}} = 0.97 \text{ microgram/cubic meter (24 hour average)}$$

A 500 MW pulverized dry bottom boiler operating at 60 percent capacity and 40 percent overall efficiency burning typical bituminous coal and controlled to meet the NSPS would emit 10 metric tons of fluorides per year - EPA-450/2-80-074 "Health Impacts, Emissions, and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted from Stationary Conventional Combustion Process," June 1980, page 54.

$$10 \text{ metric tons/year} \times \frac{2203 \text{ tons}}{2000 \text{ metric tons}} = 11 \text{ tons/year}$$

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* NSPS emission limitation

** See main text for explanation of twenty percent factor

SULFURIC ACID MIST

Regulations Governing Emissions:

NSPS, 40 CFR 60.83

Sources regulated:

Sulfuric Acid Plants - 0.15 pound per ton acid produced.

Calculation:

The reference, "A Review of Standards of Performance for New Stationary Sources - Sulfuric Acid Plants," EPA-450/3-79-003, January 1979, labels a 1300-ton per day plant as typical for this source category. Emissions from a typical well controlled plant operating continuously would be:

$$1300 \text{ tons acid/day} \times 0.15 \text{ pound*/ton acid} \times 365 \text{ days/year} \times \frac{1}{2000} \text{ ton/pound} = 35 \text{ tons/year}$$

Twenty percent of that emission rate:

$$20\% \times 35 \text{ tons/year} = \underline{7 \text{ tons/year}}$$

The resulting air quality impact may be calculated by multiplying the emission rate in tons per year by a correction factor as given in the PEDCo report, "Impact of Proposed and Alternative De Minimis Levels for Criteria Pollutants," EPA-450/2-80-072, page 4-31:

$$7 \text{ tons/year} \times 0.325 \frac{\text{microgram/cubic meter}}{\text{ton/year}} = \underline{2.3 \text{ micrograms/cubic meter}}$$

*NSPS emission limitation

TOTAL REDUCED SULFUR

Regulations Governing Emissions:

NSPS, 40 CFR 60.283

Source regulated:

Kraft pulp mills

Emission rate:

Varies for different processing units within the mill, but most rates given in parts per million of gas stream.

Calculation:

The reference, "Standards Support and Environmental Impact Statement: Proposed Standards of Performance for Kraft Pulp Mills," EPA-450/2-76-014a, September 1976 defines a 900-ton per day pulp mill as typical on page 8-4. On page 2-3, a well controlled mill emits 0.25 pounts of TRS per ton of pulp produced. Assuming continuous operation, a 900-ton per day plant would emit:

$$900 \text{ tons/day} \times 0.25 \text{ pound/ton} \times 365 \text{ days/year} \times \frac{1}{2000} \text{ ton/pound}$$

= 41 tons/year of TRS

Twenty percent of this rate would equal:

41 tons/day X 20% = 8.3 tons/year

The air quality impact from this emission rate is calculated by applying the PEDCo factor from "Impact of Proposed and Alternative De Minimis Levels for Criteria Pollutants," EPA-450/2-80-072, 1980 page 4-31:

$$8.3 \text{ tons/year} \times 0.325 \frac{\text{microgram/cubic meter}}{\text{ton/year}} = 2.7 \text{ micrograms/cubic meter (24 hour average)}$$

Since odors are of concern, a shorter averaging time of 1 hour should be considered. From page 4-21 of "Procedures for Evaluating Air Quality Impact of New Stationary Sources," EPA-450/4-77-001, October 1977, another correction factor can be used to estimate the 1-hour impact from the 24-hour impact:

$$2.7 \text{ micrograms/cubic meter} \times \frac{1}{0.4} = \underline{6.7 \text{ micrograms/cubic meter}}$$

HYDROGEN SULFIDE

Regulations Governing Emissions:

NSPS, 40 CFR 60.104

Sources regulated:

Sulfur recovery plants at petroleum refineries

Emission rate:

0.001 percent by volume in discharge gases (10 ppmv)

Calculations:

Same references used as seen in "REDUCED SULFUR COMPOUNDS." From the table 4-2 on page 4.24 of the Standards Support Document - a 6000 ppmv equals 200 pounds per hour of H_2S emissions; therefore, a 100-long ton per day source meeting NSPS at 10 ppmv must equal:

$$10 \text{ parts per million-volume} \times \frac{200 \text{ pounds/hour}}{6000 \text{ ppmv}} = 0.33 \text{ pound/hour}$$

assuming continuous operation. This rate in tons per year equals:

$$0.33 \text{ pound/hour} \times 8760 \text{ hours/year} \times \frac{1}{2000} \text{ ton/pound} = \underline{1.5 \text{ tons/year}}$$

Twenty percent equals:

$$1.5 \text{ tons/year} \times 20\% = \underline{0.3 \text{ ton/year}}$$

See June 19, 1980 memo, G. H. Wood to J.B. Weigold, "Rough Estimates of Asbestos Emission Levels."

REDUCED SULFUR COMPOUNDS

Regulations Governing Emissions:

NSPS, 40 CFR 60.104(a)(2)

Sources regulated:

Sulfur recovery plants in petroleum refineries

Emission rate:

0.030 percent by volume of discharge gases

Calculation:

A typical well controlled refinery of 100 long tons per day (see "Standards Support and Environmental Impact Statement: Proposed Standards of Performance for Petroleum Refinery Sulfur Recovery Plants," EPA-450/2-76-016a, September 1976 page 4.24,) puts out about 8 pounds per hour of total reduced sulfur:

$$8 \text{ pounds/hour} \times 8760 \text{ hours/year} \times \frac{1}{2000} \text{ ton/pound} = \underline{35 \text{ tons/year}}$$

assuming continuous operation. However the emission rate is based on 225 ppmv of total reduced sulfur in gas stream. The NSPS calls for 300 ppmv; thus, a 100-long ton per day refinery meeting NSPS would put out:

$$35 \text{ tons/day} \times \frac{300 \text{ ppmv}}{225 \text{ ppmv}} = 47 \text{ tons/year}$$

Twenty percent of this emission rate equals

$$47 \times 20\% = \underline{9.4 \text{ tons/year}}$$

Applying the PEDCo correction factor, which gives a concentration based on a 24-hour average, and the 24-hour to 1-hour averging time correction as seen under "TOTAL REDUCED SULFUR" elsewhere in these calculations, one finds the hourly impact of:

$$9.4 \text{ tons/year} \times 0.325 \frac{\text{microgram/cubic meter}}{\text{ton/year}} \times \frac{1}{0.4} = 7.6 \text{ micrograms/cubic meter}$$

BERYLLIUM

Regulations Governing Emissions:

NESHAP, 40 CFR 61.30-44

Sources Subject:

Extraction plants, ceramic plants, foundries, incinerators, and propellant plants which process beryllium ore, beryllium, beryllium oxide, beryllium alloys or beryllium containing waste, machine shops which process beryllium, beryllium oxides or any alloy (more than 5% beryllium) and rocket motor test sites.

Emission rate:

10 grams per day

Calculations:

A source meeting the NESHAP emission limit of 10 grams per day would equal a certain number of tons per year (assuming continuous operation of the source):

$$10 \text{ grams/day} \times 365 \text{ days/year} \times \frac{1}{454} \text{ pound/gram} \times \frac{1}{2000} \text{ ton/pound} = 0.004 \text{ ton/year}$$

Ten percent of this result equals*:

$$0.004 \text{ ton/year} \times 10\% = \underline{0.0004 \text{ ton/year}}$$

A 500 MW pulverized dry bottom boiler operating at 60 percent capacity and 40 percent overall efficiency burning typical bituminous coal and controlled to meet the NSPS would emit 0.004 metric tons per year of beryllium, "Health Impacts, Emissions, and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted from Stationary Conventional Combustion Sources Processes," - EPA-450/2-80-074, June 1980.

$$0.004 \text{ metric ton} \times \frac{2203 \text{ tons}}{2000 \text{ metric tons}} = \underline{0.0044 \text{ ton/year}}$$

* See main text for explanation of use at 10%.

VINYL CHLORIDE

Regulations Governing Emissions:

NESHAP, 40 CFR 61.60-71

Sources subject:

1) Ethylene dichloride plant;
2) Vinyl chloride plant;
3) Polyvinyl chloride plant;

Emission limit:

Generally 10 ppm in the exhaust gases.

Calculations:

From the "Standard Support Document and Environmental Impact Statement: Emissions Standard for Vinyl Chloride," EPA-450/2-75-009, October 1975, pages 4-80, 81, 82, a typical polyvinyl chloride plant of 68 million kilograms per year would put out 705 pounds per hour uncontrolled emissions. The control efficiency for this controlled plant would equal:

$$\text{Control efficiency } \eta = 1 - \frac{\text{controlled emissions}}{\text{uncontrolled emissions}}$$

$$\eta = 1 - \frac{45.6}{705} \qquad \eta = 0.94 \text{ or } 94\%$$

Rounding offf 94% gives good control efficiency of 95%

For the example above 68 million kilograms per year production emits 45.6 pounds of vinyl chloride per hour or:

$$45.6 \text{ pounds/hour} \times 8760 \text{ hours/year} \times \frac{1}{2000} \text{ pound/ton} = 200 \text{ tons/year}$$

assuming continuous operation. From page 3-32 of the above document, PVC plants range from 2-135 million kilograms per year. Assuming a smaller source can apply the same control efficiency as a larger source (95% efficiency), 2 thru 15 million kilograms per year plant would proportionately emit:

$$2 \times 10^6 \text{ kilograms/year} \times \frac{200 \text{ tons/year}}{68 \times 10^6 \text{ kilograms/year}} = 6 \text{ tons/year}$$

$$15 \times 10^6 \text{ kilograms/year} \times \frac{200 \text{ tons/year}}{68 \times 10^6 \text{ kilograms/year}} = 44 \text{ tons/year}$$

Thus, smaller plant emissions range from 6 to 44 tons per year. Ten percent of this range of smaller source equals

10% X 44 tons/year = 4.4 tons/year

10% X 6 tons/year = 0.6 ton/year

Assume 1 ton per year is representative of this range. Ethylene dichloride plants are also considered. The range of plant equals 70-590 million kilograms of production per year (page 3-28). A small plant, uncontrolled, 70 million kilograms per year would emit when operating continuously:

$$70 \times 10^6 \text{ kilograms production/year} \times \text{(see page 3-37) } 0.4479 \frac{\text{kilograms VC}}{\text{100 kilograms production}}$$

$$3.15 \times 10^5 \text{ kilograms/year} \times 2.2 \text{ pounds/kilogram} \times \frac{1}{2000} \text{ ton/pound}$$

= 346 tons/year (Uncontrolled emissions)

Assuming again a 95% control efficiency:

Uncontrolled rate X (1-control efficiency) = Controlled emission rate

346 tons/year X (1-0.95) = 17.3 tons/year (Controlled emissions)

Ten percent of this estimated emission rate equals:

17.3 tons/year X 10% = 1.7 tons/year

MERCURY

Regulations Governing Emissions:

National Emissions Standards for Hazardous Pollutants (NESHAP), 40 CFR 61.50-55

Sources subject:

1) Mercury ore processing plants - 2300 grams/day
2) Mercury chlor-alkali cells - 2300 grams/day
3) Incinerator or dry waste water treatment plant sludge - 3200 - grams/day

Calculations:

A source meeting the NESHAP emission of 2300 grams per day limit would equal a certain number of tons per year of emissions (assuming continuous operation of the source).

$$2300 \text{ grams/day} \times 365 \text{ days/year} \times \frac{1}{454} \text{ pound/gram}$$

$$\times \frac{1}{2000} \text{ ton/pound} = 0.93 \text{ ton/year}$$

Rounding off the result to 1.0 tons per year and taking 10% gives:

$$1.0 \text{ ton/year} \times 10\% = \underline{0.1 \text{ ton/year}}$$

A 500 MW pulverized dry bottom boiler operating at 60 percent capacity and 40 percent overall efficiency burning typical bituminous coal and controlled to meet the NSPS would emit 0.4 metric tons of mercury per year - EPA-450/2-80-074, "Health Impacts, Emissions and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted from Stationary Conventional Combustion Process," June 1980, page 54.

$$0.4 \text{ metric tons/year} \times \frac{2203 \text{ tons}}{2000 \text{ metric tons}} = \underline{0.44 \text{ ton/year}}$$